CAMBRIDGE
INTERNATIONAL EXAMINATIONS
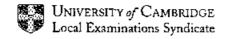
JUNE 2002

GCE Advanced Subsidiary Level
Advanced International Certificate of Education

MARK SCHEME

MAXIMUM MARK : 50

SYLLABUS/COMPONENT :9709 /6, 0390 /6

MATHEMATICS
(Probability and Statistics 1)

UNIVERSITY *of* CAMBRIDGE
Local Examinations Syndicate

Page 1	Mark Scheme	Syllabus	Paper
	AS Level & AICE Examinations – June 2002	9709, 0390	6

1 (i) not independent $P(A) \times P(B) \neq P(A \text{ and } B)$	B1 B1dep	2	
(ii) not mutually exclusive $P(A \text{ and } B) \neq 0$	B1 B1	2	Can be stated in words
2 both axes correct	B1		For correct scales and labels on at least one axis
points	M1 A1		For points at upper bounds or 15.5 or 14.5 All correct and smooth curve or straight lines
median IQ range	B1 ft M1 A1 ft	6	On mid-points or upper bounds For evaluating their UQ – theirLQ For correct answer, ft on correct upper bounds only
3 (i) $\begin{array}{ccccc} a & 1 & 4 & 9 & 16 \\ P(A=a) & \frac{1}{2} & \frac{1}{6} & \frac{1}{6} & \frac{1}{6} \end{array}$	M1 A1 A1	3	For $A = 1, 4, 9, 16,$ or $1,1,1,4,9,16$ Any three correct probabilities for 3 different vals of A All correct
(ii) $E(A) = 1 \times 1/2 + 4 \times 1/6 + 9 \times 1/6 + 16 \times 1/6$ $= 5.33$ $\text{Var}(A) = 1^2 \times \frac{1}{2} + 4^2 \times 1/6 + \ldots - (5.33)^2$ $= 30.9$	M1 A1 M1 A1	4	For calculation of Σxp where Σp must be 1 For correct answer For calculation of $\Sigma x^2 p$ – (their $E(A))^2$ Σp need not be 1 For correct answer
4 (i) $-47.2/30 = -1.573$ OR $\Sigma x - \Sigma 110 = -47.2$ and $\Sigma 110 = 3300$	B1		
$\bar{x} = 110 - 1.573 = 108 \ (108.4)$	B1		For correct answer
standard deviation $= \sqrt{\dfrac{5460}{30} - (-1.573)^2}$ $= 13.4$	M1 A1	4	For $\dfrac{5460}{30} - (their\ coded\ mean)^2$ For correct answer
(ii) $z = \dfrac{110 - 107.6}{13.8} = 0.174$ $P(X > 110) = 1 - \Phi(0.174)$ $= 1 - 0.5691$ $= 0.431$	M1 M1 A1	3	For standardising, can have $\sqrt{13.8}$ on denom not 13.8^2 For using tables correctly and finding a correct area from their z. For correct answer

PMT

Page 2	Mark Scheme	Syllabus	Paper
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5 (i) $\dfrac{7!}{2!} = 2520$	M1 A1	2	For dividing by 2 or 2! For correct answer
(ii) $\dfrac{5!}{2!} \times 3! = 360$	B1 M1 A1	 3	For 5! or equivalent For multiplying by 3! or dividing by 2! or both For correct answer
(iii) 4/7 of 2520 = 1440 OR $6! + \dfrac{6!}{2!} + \dfrac{6!}{2!} = 1440$	M2 A1 M1 A1 A1	 3	For 4/7 of their (i) For correct answer For summing options for ending in 2, 6, 8 For correct options For correct answer
(ii) (i) $\mu = 3.6$ $\dfrac{2.8 - their\,\mu}{\sigma} = -0.4$ $\sigma = 2$	B1 M1 M1 A1	 4	Stated or can be calculated later on For equation relating μ or 3.6 and σ. Must be standardised, can have ±0.4 Solving the correct equation or with a second correct equation relating μ and σ For correct answer
(ii) $(0.6554)^2 \times (0.3446)^2 \times {}_4C_2$ $+ (0.6554)^3 \times (0.3446)^1 \times {}_4C_3 + (0.6554)^4$ $= 0.879$ $(= 0.3061 + 0.3881 + 0.1845)$ OR $1 - (0.3446)^4 - (0.6554)^1 \times (0.3446)^3 \times {}_4C_3$ $(= 1 - 0.0141 - 0.1072)$ $= 0.879$	M1 B1 A1 A1 M1 B1 A1 A1	 4	For attempted binomial calculation of any 2 or 3 of P(2), P(3), P(4), needs 0.6554 in For correct numerical expression for P(2) or P(3) All in correct form For correct answer For calculation of 1 – any 2 or 3 of P(0), P(1), P(2) For correct numerical expression for P(1) or P(2) All in correct form For correct answer
7 (i) (a) $np = 11$ $np(1 - p) = 4.95$ $n = 20\ (p = 0.55)$	B1 B1 M1 A1	 4	 For solving, need to find a value for n For correct answer
(b) $P(X = 12) = (0.55)^{12} \times (0.45)^8 \times {}_{20}C_{12}$ $= 0.162$	M1 A1	 2	For $(their\ p)^{12} \times (their\ q)^{n-12} \times k \neq 1$ For correct answer
(ii) $\mu = 100 \times 0.3 = 30,\ \sigma^2 = 100 \times 0.3 \times 0.7$ $P(X < 35) = \Phi\left(\dfrac{34.5 - 30}{\sqrt{21}}\right)$ $= \Phi(0.9820)$ $= 0.837$ (exact)	B1 M1 M1 A1	 4	For both mean and variance correct, allow $\sigma = 21$ For standardising with or without cc, allow their 21 or their $\sqrt{21}$ in denom For use of any continuity correction 34.5 or 35.5 For correct answer